rived from this specimen. In *V. salvinae*, as described by Hemsley and exemplified by two specimens from Chiapas now before me, the heads are only 1 to 3; the leaves are evenly strigose-pilose over the whole surface beneath; and the considerably broader phyllaries have shining, glabrous, more or less purplish brown, indurated bases, and their tips are acuminate or apiculate and (except in the innermost) short-strigose and more or less glandular.

ENTOMOLOGY.—*The wasp* Hoplisus costalis, *a hunter of tree-hoppers.* EDWARD G. REINHARD, Canisius College (Communicated by S. A. ROHWER).

About twenty nests of the solitary wasp *Hoplisus costalis* (Cress.) were found scattered among the burrows of a large colony of bee-hunting wasps, *Philanthus gibbosus*, at Woodstock, Maryland, during the summers of 1922 and 1923. The site of this community was a sandy path, loosely paved with bricks and sheltered by a long balcony.

Exteriorly, the burrow of Hoplisus is indicated by a small mound of sand, in expanse no larger than the area which could be covered by the palm of one's hand. The nest entrance is always concealed under a covering of sand. A straw probe quickly finds the hidden doorway. From thence a slanting shaft penetrates the earth for five or six inches, making a moderate dip of about 30 degrees with the horizontal surface. At a depth of two inches the gallery is terminated by a scattered group of cells, each of which is stored with sufficient food to nourish a single Hoplisus during its larval growth. Every nursling receives for its nutriment a common diet of tree-hoppers, but the communistic system does not distribute an equal share to all. Of the 34 larvae whose provisions were listed, seven enjoyed six pieces of game, nine had five, seventeen had four, and one had only three articles to satisfy its appetite.

The victims that are selected by Hoplisus for the nourishment of her grubs are all tree-hoppers, all members of the great Homopterous family Membracidae.[1] In hunting these Membracids the wasp shows no exclusive preference for any particular species, but she does seem to restrict her choice to the mature adults, as if deeming the mere undeveloped nymphs undesirable game. I have taken more than a dozen different species of tree-hoppers from the nests which Hop-

[1] G. P. Barth states of *Gorytes canaliculatus:* "The prey of the wasp seems to be exclusively leaf-hoppers of the species *Cyrtolobus fenestratus* Fitch and *Atymna inornata* Say." Cyrtolobus and Atymna however are *Membracidae*, "tree-hoppers" therefore, though the writer calls them "leaf-hoppers" throughout his account, a term which common usage has restricted to the *Jassidae*.

lisus had provisioned in this neighborhood. Among these species were: *Ceresa bubalus* Fabricius, *Ceresa borealis* Fairmaire, *Telamona monticola* Fabricius, *Telamona tristis* Fitch, *Telamona unicolor* Fitch, *Thelia bimaculata* Fabricius, *Glossonotus crataegi* Fitch, *Archasia galeata* Fabricius, *Cyrtolobus arcuatus* Emmons?, *Vanduzea arcuata* Say, *Platycotis vittata* Fabricius, *Campylenchia latipes* Say. These Membracids were kindly determined for me by Mr. W. L. McAtee.

Hoplisus is a skilful huntress, but also a skilful paralyser. The Membracids are stung to complete immobility. Once the wasp has performed her surgical operation the victim becomes as quiet as a wax model. This state of traumatic coma persists for about a week; then the victim dies.

But is the skill of the paralyser always unerring and infallible? The following fact suggests a negative answer. On August 4, I examined a burrow of Hoplisus consisting of a shaft and a single cell. In the corridor was the female wasp, and in the cell a solitary green tree-hopper, *Ceresa borealis*. Far from being paralysed to immobility the tree-hopper could thrash its legs about very vigorously, and its wings also, though it could neither walk nor fly. These strenuous muscular movements persisted through the entire day, but on the following day the victim died, supposedly from exhaustion. Here was a case where the wasp's sting had brought about mere motor ataxia instead of complete paralysis. Hoplisus had evidently bungled badly. How can we exonerate her clumsiness? The first week of August marks the appearance of the second generation, and a single cell, provisioned with a single hopper, points to the very commencement of the wasp's active career. So let us say that it was the tyro's first operation; she was as yet a novice in wielding the lancet—and such would be by no means a fictitious excuse.

Once a suitable victim is selected and properly paralysed, Hoplisus proceeds to straddle her prey, venter to venter, grasping it close to her body with her median legs, and in this attitude transports the unresisting bug through the air. Most of the wasps carrying prey succeed in landing squarely in front of their burrow, but not unfrequently one or another happens to descend wide of the mark. That is a mishap which necessitates an awkward portage along the ground. The tree-hopper's high back or projecting horns cause the wasp many a tumble and a tussle before she finally gains the nest with her burden.

When the wasp arrives at her burrow she scrapes it open and enters without releasing her prey. But once inside she usually drops

the hopper just within the vestibule, then turns around and pulls the prey down after her into the depths of the nest.

The egg of *Hoplisus costalis* is about three millimeters long; smooth, white, and bow-shaped. It is carefully tucked beneath the folded legs of the tree-hopper, along one side of its broad breast. One end is fixed to the metasternum near the hind coxa; the other arches forward towards the hopper's head.

Sometimes the wasp makes use of a curious appliance to hold her precious egg in position. On the sternum of Membracidae, alongside the middle leg, there is a projecting spur, a curved, blade-like process. It forms with the adjoining coxa a deep notch. When closed by the overlying femur this notch becomes a socket exactly fitted to receive the wasp's egg. When particularly careful the mother slips the end of her egg into this natural pocket, thus clamping it more securely in place.

It takes but two days for the egg to hatch. Five days are spent by the larva in consuming the tree-hoppers. Then the cocoon is fashioned—an oblong-ovate capsule put together with silk and sand; a neat and tough pupal casket, not without artistic merit.

The nests of this wasp are sometimes parasitized by a small Tachinid. Two cells were unearthed on August 2, provisioned with green tree-hoppers but each occupied by a Dipterous maggot. Three days later these larvae formed their coarctate kegs, but the adult flies failed to emerge. Mr. C. T. Greene, of the United States Bureau of Entomology, examined the puparia, and found that they were the pupal cases of *Pachyophthalmus signatus* Meigen. Two empty pupuria of the same species were also taken from an old Hoplisus cell in which there were the remains of four Membracids.

A bold and successful ravager of the nests of Hoplisus is her parasitic relative, the Nysson wasp, *Brachystegus hoplisivora* Rohwer. The interesting activities of this Nysson parasite will be related in a future paper.

Hoplisus costalis was described in 1872, under the generic name *Gorytes*, by Cresson from a female collected in Texas. Since the male has heretofore not been known, a brief description of it is here given. The male differs from the female in the following points: Form smaller and less robust; its color is brighter, and is of a more brilliant black and a lighter yellow than the female; the basal half of the flagellum is more darkly ferruginous beneath; the clypeus is black with a median yellow spot; several yellow markings of the female, viz., line on posterior orbits, spot on mandibles, spot on metanotum,

are not present in the male; the femora are black beneath, though all are tipped with yellow; the wings are less densely smoked along the costal margin; the anterior tarsi are without combs, and the apical abdominal tergite is rounded convexly, not flattened like that of the female.

Several specimens of both sexes bearing my label are preserved in the collections of the United States National Museum. A reared pair was presented also to the American Museum of Natural History.

SCIENTIFIC NOTES AND NEWS

J. B. EBY resigned from the U. S. Geological Survey, the end of February, to engage in petroleum engineering in Texas.

Dr. R. B. SOSMAN, of the Geophysical Laboratory, Carnegie Institution of Washington, will give a series of lectures on geophysics at the Massachusetts Institute of Technology in March and April.

On February 7 occurred the death of WILLIAM FRANCIS HILLEBRAND, a man whose name is known wherever chemistry is taught or practised.

Dr. Hillebrand was born in Honolulu, December 12, 1853. After two years at Cornell University (1870–72) he completed his training at the Universities of Heidelberg and Strassburg and at the Mining Academy at Freiberg. Returning to America he began practise as an assayer but entered the laboratory of the U. S. Geological Survey at Denver in 1880. He was transferred to Washington in 1885 and the remaining forty years of his life were spent here. In 1908 he became chief chemist of the Bureau of Standards.

He made many important contributions to his chosen science but was best known for his work on the analysis of rocks and minerals. Dr. Hillebrand was the first chemist to make a practice of determining all of the so-called minor constituents of minerals and rocks. His painstaking work in this field provided much information of geological significance, and will undoubtedly throw light on generalizations which are still to be made. His methods for rock analysis were described in five Bulletins of the Geological Survey, the last one, Bulletin 700, appearing in 1919. These bulletins have always been in great demand. Two of them were translated and published in Germany. At the time of his death he had already spent a year in the preparation of a book on inorganic analysis. Fortunately his notes are so complete that his associate, G. E. F. Lundell, will be able to finish this work.

Dr. Hillebrand was one of the world's great chemists because of his knowledge in his chosen field and because of his absolute honesty of purpose and the high standards he set for himself. His attitude toward his work and his achievements in it inevitably brought recognition from his fellow scientists. He was President of the Washington Chemical Society in 1903 and of the American Chemical Society in 1906, at a critical time in the history of that organization. He was a member of the American Philosophical Society and of the National Academy of Sciences. In 1916 Columbia University awarded him the Chandler medal for his attainments in chemistry. He was a charter member of the ACADEMY.